

Remarks

By the present amendment, claims 1, 5, 14, and 30 have been amended to more clearly define the claimed invention and to maintain proper dependencies. Claims 19-26, 34-35, 37, and 42-47 have been withdrawn. Claims 2-4, 7-8, and 29 have been canceled, without prejudice or disclaimer. Claim 48 has been added. Accordingly, claims 1, 5-6, 9-18, 27-33, 36, 38-41, and 48 are pending in the present application. It is believed and intended that no new matter has been added by this amendment. Reconsideration and allowance of all pending claims are respectfully requested in view of the following remarks.

I. Claim Objection

The Examiner suggested amendments to claims 5 and 14 as having listed informalities. Claims 5 and 14 have been amended to correct these informalities. Such amendments are not made in response to the prior art and do not narrow the scope of the claims.

II. Claim Rejections Under 35 U.S.C. § 112

Claim 29-30 were rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention, with the Examiner citing the different numbers of guide shafts claimed. Claims 1 and 30 have been amended, and claim 29 has been canceled, to overcome the rejection. Such amendments are not made in response to the prior art and do not narrow the scope of the claims.

III. Claim Rejections Under 35 U.S.C. § 103

Claims 1, 4-5, 29-30, and 36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,519,576, issued May 28, 1985 to Mitchell E. Winegeart (hereafter referenced as “the ‘576 patent”) in view of U.S. Patent No. 5,324,008, issued June 28, 1994 to Giulio Bonetti (hereafter referenced as “the ‘008 patent”) and further in view of in view of U.S. Patent Application Publication No. 2002/0007950, published January 24, 2002 by Neil Andrew Abercrombie Simpson et al. (hereafter referenced as “the ‘950 publication”). It is respectfully submitted that the present amendments to the pending claims overcome this rejection for at least the following reasons.

As amended, claim 1 recites a completion suspension valve system. A suspension valve housing has a production bore. A valve element is disposed in the suspension valve housing, the valve element being an apertured ball valve element with a valve bore offset from the centre of the ball, so that one portion of the ball element is relatively thick and another portion of the valve element is relatively thin. The valve is remotely actuatable between an open position and a closed position. The production bore is offset from the centre of the valve housing. Actuation means are coupled to the ball element for permitting remote actuation of the ball element, the actuation means comprising at least one moveable guide shaft disposed substantially parallel to the production bore. At least two actuation bars are coupled between the respective guide shafts and to the apertured ball element. The actuation bars are coupled to the guide shaft by rotatable pin joints, and are slidingly located in respective bar pockets of the ball element.

The '576 patent discloses a Kelly valve with a rotatable tubular body having a longitudinal throughbore for conveying fluids. A valve member is movably disposed within the body for valving the fluid flow through the bore (Abstract). Kelly valves are used in conjunction with a powered rotary table to rotate the drill string at the rig floor (i.e., the relatively small work area on the rig platform in which the rig crew conducts operations), and can be used to close the drill string bore at the rig floor (Col. 1, lines 15-20).

The '008 patent discloses a fluid ducting valve of the type comprising an interception ball fitted with a through-duct. The through-duct of the ball is located with its longitudinal axis offset in the downstream area relative to the axis of rotation of the ball, such that the upstream apertures of the duct are always closed before the downstream apertures move on downstream sealing rings (Abstract).

The '950 publication discloses a downhole valve which has a body defining a through bore and a valve seat. A valve member is mounted in the body and is moveable between positions to open and close the bore. The valve member defines a portion of a surface of a sphere (§0004).

It is respectfully submitted that neither the '576 patent, the '008 patent, the '950 publication, nor any combination thereof teaches, shows, discloses, or suggests a completion suspension valve system comprising a valve element being an apertured ball valve element with a valve bore offset from the centre of the ball, so that one portion of the ball element is relatively thick and another portion of the valve element is relatively thin, and the production bore being offset from the centre of the valve housing, as presently claimed in claim 1.

The Examiner states, in section 6 of the May 24 Office Action, that the '576 patent discloses a suspension valve. The Applicants respectfully differ with this characterization. As discussed on page 2, lines 9-13, of the present specification, well suspension using the claimed suspension valve occurs downhole. In contrast, the '576 patent discloses a kelly valve which is used on the rig floor (i.e., at/near the ocean's surface).

Because the rig floor could be thousands of feet above the ocean floor, with the subsea wellhead assembly located at or even below the ocean floor, one of ordinary skill in the art would understand that the kelly valve device of the '576 patent is not suitable for use as the claimed suspension valve. For example, there are significant sealing, pressure, corrosion, and/or constrained space factors necessary on the ocean floor for the claimed device that are not considerations for the open-air rig floor use environment for the kelly valve of the '576 patent. Therefore, it is respectfully submitted that undue experimentation and extensive modification would be needed to refit the kelly valve of the '576 patent to serve in the very different use environment of the claimed suspension valve, and one of ordinary skill in the art would not find it obvious to make the Examiner's suggested substitution.

Moreover, one of ordinary skill in the art also would be unlikely to use the teachings of the '576 patent, the '008 patent, and the '950 publication as set forth by the Examiner in the May 24 Office Action because there is no basis in the art for creating the proposed combination, other than impermissible hindsight knowledge of the present invention. In section 6 of the May 24 Office Action, the Examiner states that one of ordinary skill in the art would have been motivated to modify the kelly

valve of the '576 patent with the offset ball valve bore taught in the '008 patent to increase the strength of one side of the valve body and allow the system to withstand a higher pressure differential. The Applicants, however, respectfully disagree with this reasoning. The actuation mechanisms are located outside the production bore in the kelly valve of the '576 patent and, because the kelly valve is located atop the uppermost section of drill pipe (Col. 5, lines 23-25 and Fig. 8 of the '576 patent), there is no need for economy of spacing. Accordingly, the Applicants respectfully submit that one of ordinary skill in the art, looking to increase the strength of one side of the valve body, would simply substitute a larger commercially available center bore kelly valve, rather than undertake the complex custom ball and seat design and fabrication required to raise the valve strength while keeping the overall diameter of the device constant (since, as before, space constraints are not present in the use environment of the '576 patent as they are for the suspension valve environment of the claimed invention). There is, accordingly, no reason for an offset ball valve bore to be provided to the kelly valve of the '576 patent other than impermissible hindsight knowledge of the present invention.

One of ordinary skill in the art also would likely not be motivated to strengthen one side of the valve body of the '576 patent because the pressures exerted upon the kelly valve at the top of the valve string (as described in the '576 patent) by the oil flowing therethrough are much smaller than the oil pressures within the claimed suspension valve, which often needs to withstand the pressure of the thousands of feet of oil located in the drill string between the suspension valve and the kelly valve.

Additionally, as can be seen in at least Figs. 2a-2c of the '008 patent, and under the action described at col. 2, line 62 through col. 3, line 16, the ball valve bore of the '008 patent must be substantially smaller than the adjoining inflow and outflow pipes, and this seems to be a crucial feature of the design of the '008 patent.

Therefore, if the offset-bored ball 8 of the '008 patent were to be substituted for the spherical valve member 20 of the '576 patent, there would necessarily be a dramatic bottleneck between the much-smaller offset ball valve bore and the surrounding bore (element 16 in the '576 patent) of the valve and adjacent piping.

The Applicants respectfully submit that one of ordinary skill in the art would be loath to modify the valve of the '576 patent with the offset-bored ball 8 of the '008 patent because this sudden and extreme change in available flow area across the valve would provide an unwelcome and potentially dangerous necking down of flow and attendant pressure increase at the valve. This radical flow restriction either would greatly reduce the available flow rate through the valve of the '576 patent or would necessitate that the device of the '576 patent be markedly scaled up in size to allow for the reduced throughbore size of the offset-bored ball 8 of the '008 patent and still maintain desirable fluid flow rates. Either of these options for combining the references as suggested by the Examiner would be unworkable and/or undesirable when solving the problem addressed by the present invention, particularly when one of ordinary skill in the art is not space-constrained at the location of the kelly valve and could simply place a larger conventional ball valve in the kelly valve of the '576 patent if a higher valve body strength were to be required.

Finally, in section 6 of the May 24 Office Action, the Examiner asserts that one of ordinary skill in the art would have been motivated to modify the structure taught in the '576 patent and the '008 patent with the elements taught in the '950 publication because an offset production bore is known to provide means for allowing additional room in the housing for the valve and actuation components. The Applicants respectfully submit, however, that one of ordinary skill in the art would have no reason to allow additional room in the housing of the Kelly valve of the '576 patent for the valve and actuation components because there is no restraint on the size of the housing taught by the '576 patent. That person of ordinary skill in the art, rather than undertake the expensive machining of a specialty offset-bored valve, would be more likely to merely enlarge the housing or place the valve and actuation components at least partially outside the housing, as is done with certain components of the second embodiment (shown in Figs. 7-9) of the '576 patent. In contrast, the claimed invention, by virtue of being part of a seafloor valve suspension system, is constrained by the space available within the inner casing 18 (as shown in Fig. 3 of the present application).

Claim 48 has been added, with support found at least in Fig. 4 and p.18, lines 11-16, of the specification, to more explicitly claim the constrained space envelope of the suspension valve environment.

For at least these reasons, one of ordinary skill in the art would not be motivated to make the combination proposed by the Examiner. Even if such a combination, inspired by impermissible hindsight of the present invention, were to be made, the intended function of one or more of the combined references would be

destroyed. In view of the foregoing, it is respectfully submitted that claim 1 is not obvious in view of the prior art references of record and is allowable.

Claims 4 and 29 have been canceled, without prejudice or disclaimer, thus mooted this rejection with respect thereto.

Since dependent claims 5, 29, and 36 are each dependent upon independent claim 1, which is believed to be patentable as set forth above, it is respectfully submitted that the dependent claims are patentable at least by virtue of their dependency, as well as for the separate recitations therein. Accordingly, the allowance of claims 1, 5, 29, and 36 is respectfully requested.

Claims 6, 9-12, and 31-33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the '576 patent, the '008 patent, and the '950 publication, and further in view of U.S. Patent No. 5,884,703, issued March 23, 1999 to Virgilio Garcia-Soule et al. (hereafter referenced as "the '703 patent"). It is respectfully submitted that the present amendments to the pending claims overcome this rejection for at least the following reasons.

As set forth above, neither the '576 patent, the '008 patent, nor the '950 publication, nor any combination thereof, is operative to render the claimed invention obvious, and the '703 patent does not remedy this deficiency.

Claim 9 recites a system as claimed in claim 1 wherein the valve element may be actuated to remain in an open position, the system including ram means for moving between a first non-engaged position wherein the valve element remains normally open and a second engaged position where the valve is set in the open position. In section 11 of the May 24 Office Action, the Examiner states that the '703

patent teaches that ram means (characterized as elements 30 and 32 in the '703 patent) may be used to move between a first non-engaged position where the valve element remains normally open and a second engaged position where the valve is set in the open position, with citation to Col. 9, lines 5+ of the '703 patent. The Applicants respectfully submit, however, that the cited portion of the '703 patent actually teaches the direct *opposite*, with the cited language reading, in relevant part "the compression spring 32, by axially downwardly biasing the piston 30, which is, in turn, connected to the control arms 28, biases the ball 22 to its *closed* position" (emphasis added). Accordingly, the Examiner has failed to make a *prima facie* rejection of claim 9 under 35 U.S.C. § 103(a).

It is therefore respectfully submitted that neither the '576 patent, the '008 patent, the '950 publication, and the '703 patent, nor any combination thereof teaches, shows, discloses, or suggests ram means for moving between a first non-engaged position wherein the valve element remains normally open and a second engaged position where the valve is set in the open position, as presently claimed in claim 9. In view of the foregoing, it is respectfully submitted that claim 9 is not obvious in view of the prior art references of record and is allowable.

Since dependent claims 6, 9-12, and 31-33 are each dependent upon one of independent claims 1 and 14, which are each believed to be patentable as set forth above and below, it is respectfully submitted that the dependent claims are patentable at least by virtue of their dependency, as well as for the separate recitations therein. Accordingly, the allowance of claims 6, 9-12, and 31-33 is respectfully requested.

Claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the '576 patent, the '008 patent, and the '950 publication, and further in view of U.S. Patent No. 5,884,706, issued March 23, 1999 to Jeffrey Charles Edwards (hereafter referenced as "the '706 patent"). It is respectfully submitted that the present amendments to the pending claims overcome this rejection for at least the following reasons.

As set forth above, neither the '576 patent, the '008 patent, nor the '950 publication, nor any combination thereof, is operative to render the claimed invention obvious, and the '706 patent does not remedy this deficiency.

Moreover, it is respectfully submitted that neither '576 patent, the '008 patent, nor the '950 publication, nor any combination thereof teaches, shows, discloses, or suggests providing trunnions with two arcuated portions and a rebate in each trunnion bore bearing for receiving the arcuate portion when the ball is in the closed position, as presently claimed in claim 13. The Examiner has not indicated where, in the '706 patent, he considers this recitation to be taught, and he is respectfully requested to do so.

Pending such indication, however, the Applicants have reviewed the '706 patent diligently, and the only apparent teaching regarding mounting of the ball in the '706 patent is the Col. 4, lines 14-21 mention of flat faces 20 into which slots (not shown) are machined. Though the Examiner indicates in section 15 of the May 24 Office Action that he considers elements 26 and 28 of the '706 patent to be analogous to the claimed trunnions. The Applicants respectfully note, however, that elements 26 and 28 of the '706 patent are the upper and lower valve seats,

respectively, and that, while lower valve seat 28 has an arcuate surface for sealingly contacting the ball 18, upper valve seat 26 does not appear to have any such arcuate property at all, with neither the upper or lower valve seats 26 and 28 of the '706 patent appearing to have an arcuate portion which is received by a rebate in each trunnion bore bearing, for which the Examiner has also failed to indicate an analogous structure in the '706 patent.

In view of the foregoing, it is respectfully submitted that claim 13 is not obvious in view of the prior art references of record and is allowable.

Since dependent claim 13 is dependent upon independent claim 1, which is believed to be patentable as set forth above, it is respectfully submitted that the dependent claim is patentable at least by virtue of its dependency, as well as for the separate recitations therein. Accordingly, the allowance of claim 13 is respectfully requested.

Claims 14, 16, and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,992,527, issued November 30, 1999 to David Garnham et al. (hereafter referenced as "the '527 patent") in view of the '576 patent and further in view of the '950 publication. It is respectfully submitted that the present claims overcome this rejection for at least the following reasons.

As amended, claim 14 recites a method of remotely suspending and desuspending a well. A dual bore tubing hanger having a production bore and an annulus bore is provided. A remotely operable valve is disposed in the production bore, the production bore being offset from the centre of the valve housing. A guide shaft is actuated to move rectilinearly in the direction of the production bore.

Slidable actuating bars are coupled between the guide shaft and the apertured ball valve element so that said valve element is rotatable as said guide shaft moves rectilinearly. The valve is actuated remotely between an open and a closed position.

The above remarks concerning the '576 patent and the '950 publication are incorporated herein by reference, to the extent applicable to claim 14.

It is respectfully submitted that neither the '527 patent, the '576 patent, the '950 publication, nor any combination thereof teaches, shows, discloses, or suggests that a remotely operable valve is disposed in the production bore, the production bore being offset from the centre of the valve housing, as presently claimed.

In section 17 of the May 24 Office Action, the Examiner states that one of ordinary skill in the art would have been motivated to modify the structure of the '527 patent and the '576 patent with the offset production bore of the '950 publication to provide means for allowing additional room in the housing for the valve and actuation components. However, the Applicants respectfully submit that one of ordinary skill in the art would have no need to provide additional room in the housing of the '527 patent because the '527 patent includes enough room for an annulus bore (12) on the left side of the production bore (11), as shown in Fig. 1 of the '527 patent. Since the production bore (11) is centered in the tree (10) of the '527 patent (i.e., it is a "central" vertical production bore, aligned with a production bore in the tubing hanger, Col. 3, lines 47-49), there must be an area of unused space on the right side of the production bore which is as large as the annulus bore, which comports with the depiction of Fig. 1 of the '527 patent. One of ordinary skill in the art would be

much more motivated to use that unused space for valve actuation components when combining the housing of the '527 patent with the valve mechanisms of the '576 patent than to undertake the complicated redesign of an offset bore as suggested by the Examiner, absent impermissible hindsight knowledge of the present invention.

Additionally, it is respectfully submitted that the combination of the offset bore of the '950 publication with the housing of the '527 patent, as suggested by the Examiner, would destroy the function of the '527 patent. The '527 patent teaches that the production tubing 7 is oriented in line with the production bore 9 of the tubing hanger 6 and in line with the production bore 11 of the in-line tree 10 (Figs. 1-2 and Col. 3, lines 37-56). Offsetting the production bore 11 from the center of the housing of the '527 patent would necessarily destroy this collinearity of bores and introduce an undesirable "jog" in the fluid path through the wellhead structures of the '527 patent. Additionally, because the in-line tree 10 is landed concentrically within the wellhead housing 3 as shown in Fig. 1, one of ordinary skill in the art would understand that it would not be possible to just shift the center of the in-line tree 10 to one side to accommodate an offset production bore 11 without extensive redesign and undue modification of the structures of the '527 patent to maintain the desirable collinearity of bores.

In view of the foregoing, it is respectfully submitted that claim 14 is not obvious in view of the prior art references of record and is allowable.

Since dependent claims 16 and 17 are dependent upon independent claim 14, which is believed to be patentable as set forth above, it is respectfully

submitted that the dependent claims are patentable at least by virtue of their dependency, as well as for the separate recitations therein. Accordingly, the allowance of claims 14, 16, and 17 is respectfully requested.

Claims 15, 18, and 33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the '527 patent, the '576 patent, the '950 publication, and further in view of the '703 patent. It is respectfully submitted that the present claims overcome this rejection for at least the following reasons.

As set forth above, neither the '527 patent, the '576 patent, nor the '950 publication, nor any combination thereof, is operative to render the claimed invention obvious, and the '703 patent does not remedy this deficiency.

Since dependent claims 15, 18, and 33 are each dependent upon independent claim 14, which is believed to be patentable as set forth above, it is respectfully submitted that the dependent claims are patentable at least by virtue of their dependency, as well as for the separate recitations therein. Accordingly, the allowance of claims 15, 18, and 33 is respectfully requested.

Claims 27, 28, and 38-41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the '527 patent, the '576 patent, and the '950 publication, and further in view of the '008 patent. It is respectfully submitted that the present amendments to the pending claims overcome this rejection for at least the following reasons.

As set forth above, neither the '527 patent, the '576 patent, nor the '950 publication, nor any combination thereof, is operative to render the claimed invention obvious, and the '008 patent does not remedy this deficiency.

Since dependent claims 27, 28, 39, and 41 are each dependent upon one of independent claims 1, 38, and 40, which are believed to be patentable as set forth above, it is respectfully submitted that the dependent claims are patentable at least by virtue of their dependency, as well as for the separate recitations therein. Accordingly, the allowance of claims 27, 28, and 38-41 is respectfully requested.

IV. Conclusion

In view of the foregoing, reconsideration and allowance of this application are believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 20-0090. Please also credit any overpayments to this Deposit Account.

Respectfully submitted,

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